The Conflict between Conservation and Poverty

An Honors Thesis (HONR 499)

by

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Abstract

Two important issues in today's society are poverty and the loss of biodiversity in our natural world. Though seemingly unrelated, these two concepts impact each other when they are in close contact. Similarly, they are also influenced by the same environmental and societal factors and consequences. A few of these extraneous factors include climate change, deforestation, and tourism. Like ecological systems, many of these factors are interconnected and influence each other as well. How poverty and biodiversity are related, the ways in which they influence each other, and how they are affected by similar components are explored and discussed in order to determine how these factors should be considered in the attempt to combat either global poverty or the loss of biodiversity.

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Process Analysis Statement

The purpose of this project was to explore the relationship between biodiversity conservation and poverty. Both are important issues and I wanted the project to address both my passion for wildlife biology and my desire to help others, especially those in other countries. The goal of this project was to inform the reader about these issues and how they are related. The issues of global poverty and biodiversity loss are too intricate to thoroughly analyze in one paper, so this project is only meant to introduce some of the factors involved in this association. By doing so, it provides a framework for further study in order to better understand these issues in the future. By gaining a comprehensive understanding of these problems, we will be better able to solve them.

To research this topic, I found sources on poverty and biodiversity, discussed both separately and together. As I continued my research, I discovered not only how these topics affect each other, but also how they are both affected by extraneous factors. As I came across these factors, my research changed to examine each factor individually. The entire research process was an exploration of these issues and how they were connected. In order to organize them into a cohesive paper, I was able to organize the similarities between the different factors until their association, as well as their consequences, became clear. It was difficult to organize these relationships into a cohesive essay. Many of the different factors of this relationship are interconnected. Not only did the extraneous factors impact my primary topics, but they impacted each other as well. In an effort to avoid constant repetition, I discussed these factors individually and only briefly mentioned them in other sections of the essay to demonstrate the relationship without diluting the focus of that particular section.

During this process, I learned that the relationship between biodiversity conservation and poverty is much more intricate and nuanced than I had previously thought. Not only is it more complex, but an understanding of this relationship is necessary in order to work towards the solutions for both of these problems. Regarding myself, I learned that I do not have to choose between helping people in my future career, and protecting and studying nature. By working to improve one issue, I can simultaneously aid the other. This project has given me greater insight regarding my priorities as well as a possible career path.

The Conflict between Conservation and Poverty

Introduction

Two important issues in today's global society are poverty and the loss of wildlife biodiversity. Although these topics may seem unrelated, they closely influence each other in areas where poverty and wildlife reside in close proximity. This relationship is not as simple as each issue hindering the other. Poverty and biodiversity, and the conservation of biodiversity, are influenced by both each other as well as extraneous factors. The following is an exploration of how poverty and biodiversity are related, as well as how they are affected by similar factors in one of the most influential and threatened biomes of the world: forests.

Biodiversity

Biodiversity is the diversity of all life on Earth (Bowles 9; van Ginkel 264). Not only does this apply to the diversity of species, but it also includes diversity at the genetic and ecosystem levels (van Ginkel 264). As it encompasses all living organisms on the planet, biodiversity influences many factors and cycles within the biosphere (Bowles 11). These processes include "atmospheric chemical composition, temperature… hydrological cycles… soil formation, nutrient cycling, pollination, biological control, primary food production, and other major ecosystem functions", to name a few (Bowles 11). Many of these components of our environment are interconnected, and a change in one process can influence the others causing the intricate balance of our biosphere to shift (Living Planet 106).

Of all the biomes that make up the biosphere, one of the most important is forests. Forests envelope approximately "3.4 billion hectares (8.5 billion acres) of the earth, or 27 percent of [the land's] surface" (Bowles 115). As a whole, forests house approximately 80% of all terrestrial species, including "plants, animals, fungi and bacteria" (WWF). The nature of the forest's

biodiversity is dependent on the type of forest present, which in turn is determined by the geographical and chemical characteristics of its location, such as its "latitude, local soil, rainfall and prevailing temperatures" (WWF). Forests can be "tropical, subtropical, temperate, or boreal", and tropical forests include "tropical rain, tropical moist deciduous, tropical dry, and tropical mountain forests" (Schroth 16). Of these, tropical rainforests possess superior levels of biodiversity and complexity (WWF). They are primarily characterized by their year-long warm temperatures and extensive rainfall (WWF). Some tropical rainforests are more diverse than others, and each rainforest's biodiversity potential differs from one location to another (Bowles 169). Even so, more than half of all terrestrial species live in tropical forests, making them uniquely influential in the evolutionary history of our planet (Schroth 16).

Two forested regions that are well-known for their biodiversity are the Amazon rainforest and the forests in China. Amazonia possesses many species of "bromeliads, epiphytes, and palms", and approximately 60% of its trees are legumes (Rainforest Conservation Fund). China, on the other hand, possesses many different forest types in its massive range (Hyde 177). Due to its degree of environmental diversity, China's biodiversity is one of the highest in the world (Hyde 177). Although its forests sport "8,000 species of woody plants", 4,400 birds, 210 amphibians, and 320 reptiles, 15-20% of these species are in danger of becoming extinct (Hyde 177). Recently, 200 of these species have succumbed to extinction (Hyde 177).

On the geologic time scale, we are currently living through the sixth mass extinction of our planet (Schroth 15). The current estimate of the global rate of extinction is 10%, though some specific regions have higher estimates like China (Hyde 183-184). This global rate of decline in biodiversity has been increasing since humans evolved (Schroth 15) and has now grown to 1,000 times greater than past rates of extinction (Ecosystems 4). The cost of this has been a global decline not only in species, but in genetic diversity as well (Ecosystems 37). This

is especially true for cultivated species (Ecosystems 37). Deforestation, land degradation, and expanding agriculture are the primary culprits for this loss of biodiversity (Hyde 177; Schroth 19). As the nutrients in overused agricultural lands become depleted, farmers find or create new fields to replace those that are no longer useable. Even so, land degradation is fueled by many factors, such as "habitat loss and fragmentation, exploitation, pollution, introductions of nonnative species, and human-induced global change" (Schroth 19). All of these factors deplete biodiversity over time and land degradation is expected to be the primary environmental aggressor for tropical ecosystems in the next 100 years (Schroth 19).

Poverty and Biodiversity

Not only are forests essential for maintaining much of the world's biodiversity, but they are home to 300 million people across the globe, more than a third of which depend on the forests for survival (WWF). In this way, the fates of forests and of the poorest people in society are connected (Brainard 89). Countries that are rich in natural resources ("minerals, metals", etc.) tend to develop more slowly than other countries and consequently experience greater income inequality (van Ginkel 89). This is directly related to the country's degree of isolation, and natural forests are some of the most isolated regions in the world (Hyde 152-153). The preservation of these natural areas is in part due to their inaccessibility and limited agricultural potential (Hyde 152-153). As a result, the instigators and consequences of "isolation, poverty, and extensive forest cover" are often interwoven and separating one cause from another is exceedingly difficult (Hyde 152-13).

Poverty in these regions is not a simple lack of money or resources. Rather, it is driven by a collection of "complex and multi-faceted systems of deprivation" (Mowforth 340). Consequently, the prospect of measuring poverty presents many challenges (Mowforth 334). A

person's well-being is dependent on more than just income alone; it is also dependent on health, access to basic necessities, a safe living environment, and a supportive community (Mowforth 334). 1.1 billion people earned only $1 a day in 2001, 70% of whom lived in rural areas, and were forced to supplement their incomes with "agriculture, grazing, and hunting" (Ecosystems 61). Consequently, some of the environmental problems faced by forests today are exacerbated by the high population growth in these areas (Rainforest Conservation Fund). Furthermore, these problems most commonly occur in tropical areas which have the highest rates of population growth, high levels of poverty, and rampant economic inequity (Rainforest Conservation Fund).

On a narrower scope, deforestation in forested areas is actively related to poverty (Rainforest Conservation Fund). These people, especially those who only make $1 a day, use the forests to search for basic necessities that they cannot afford to buy, such as food, shelter, or energy sources such as wood (Rainforest Conservation Fund). Millions of the poor take advantage of the services the forests provide, using them for fishing, hunting, gathering, water, medicine, rubber, thatch, timber, fuelwood, and small-scale agriculture (WWF; Bowles 14; Smith 168; Brainard 20). These people also receive indirect benefits from the forest. Forests naturally protect against floods and drought by absorbing water, filtering out harmful pathogens and pollution from the water, and slowly releasing it back into the soil (Brainard 20). Many people also value the forests as part of their religion and culture which are often inspired by these forests (Brainard 20; Bowles 115). 300 to 400 languages and cultures survive in the Amazon and the Congo (Bowles 115). Since these cultures and religions are dependent on their environment, they too disappear with the forests (Ecosystems 60; Bowles 115).

The destruction of forests and biodiversity can also have political consequences. A term used to describe this is "ecosecurity" which refers to the role that biodiversity plays "in maintaining worldwide geopolitical stability" (Bowles 14). Third-world countries are more

dependent on forest resources for survival than developed countries, so the loss of that vital resource would deny necessities to those in poverty (Bowles 14). If these resources do disappear, then these necessities would need to be imported, compounding the cost to individuals and their families if they can be paid for at all (Bowles 14). If not, this scenario could force these people to flee their homes which could create political conflicts and destabilize economies (Bowles 14). While this primarily affects the poor, much of the harmful actions that decrease a forest's ability to provide services are done by the poor (Ecosystems 2). Due to human population growth in these areas, much of the rainforest is predicted to be destroyed in the next 50 years for the sake of "agriculture, mining, housing, and pasture" (Rainforest Conservation Fund). Wood is also a valuable commodity as it is used as fuel for cooking and heating (WWF). This destruction to forests around the world is being done at very high rates and has the potential to decimate the lives of society's most vulnerable people (WWF).

Since 1992, deforestation has claimed over 1.5 million square kilometers of forest habitat (Brainard 88). The people who live in these environments are inherently at great risk, not only from the loss of resources but also from climate change (Brainard 45, 50). Climate change and habitat loss both cause species extinction which could be devastating to the people who rely on these species for survival (Brainard 50). The most significant factor in habitat loss for terrestrial ecosystems has been land cover change (Ecosystems 67). Although much of this land cover change is being done to increase agricultural production, which is invaluable for many people living in poverty, the environmental fallout from this action could eventually do more harm than good (Ecosystems 67). Food security is frail or nonexistent in these areas, and altering the environment, as is done by climate change, puts what little foundation of food security they have in jeopardy (Brainard 48).

Developing countries are also incredibly vulnerable to climate change (Brainard 45). The "social, economic, and environmental" results of climate change reduce the countries' ability to adapt to these effects (Brainard 45). Rural poor people are even more vulnerable to climate change, especially if they do not have access to clean water, reliable agriculture, education, gender equality, have poor health, or live in a dangerous location (Ecosystems 2, 13; Brainard 45). Since the increased vulnerability of these people is exacerbated by changes in their environment, one method of protecting them would be to manage ecosystem services and conserve forest habitats (Ecosystems 2; Brainard 20). Whatever approach is taken, it is vital that the environment be protected and conserved (Living Planet 106). If impoverished people live in a depleted environment, then they would not have access to the safety and resources necessary for survival in which case any attempt to improve their health or economic standing would be futile (Living Planet 106).

Climate Change

The majority of climate change is the result of changes in the atmospheric composition from greenhouse gas emissions, and most of these emissions come from anthropogenic activities (Brainard 43). Carbon dioxide is largely released by fossil fuel burning in industrialized countries, while gasses like methane and nitrous oxides are primarily released by agriculture and forestry in developing countries (Brainard 43). Approximately 17-25% of greenhouse gas emissions is the result of deforestation and land degradation in tropical forests (Brainard 87). This emits more greenhouse gasses than all of transportation combined and is only second to energy production and use (Brainard 87; Mowforth 318). The primary sources of this mass deforestation include Brazil, Indonesia, China, and the United States (Brainard 92). Consequently, a cost-effective method of reducing these emissions is to conserve forests and prevent deforestation and land degradation (Mowforth 318).

Deforestation emits such a large volume of greenhouse gasses because forests naturally act as carbon sinks (WWF). A carbon sink is a natural source that absorbs free-floating gasses in the atmosphere that would otherwise contribute to climate change (WWF). Forests absorb carbon dioxide and store it in their tissues as they grow and undergo photosynthesis (WWF) in a process known as carbon sequestration (Mowforth 318). Tropical forests can absorb and contain approximately 210 gigatons of carbon, so these forests have a significant impact on the concentration of greenhouse gasses in the atmosphere (WWF).

Not only is deforestation releasing greenhouse gasses, but both deforestation and climate change are putting biodiversity in jeopardy. As the evidence currently stands, many species are at risk of extinction in forests all around the globe (Brainard 50). Tropical regions like Central and South America stand to lose many of their species, and several regions of Latin America with high species concentrations are already falling victim to habitat loss (Brainard 50). On the other side of the world, Asia could lose half of its biodiversity as a result of climate change (Brainard 50). Even if they do not become extinct, changes in climate and biological cycles will force some species to alter their ranges which will place stress not only on the species, but also on the forest as a whole (Brainard 51).

Many of the effects of climate change on species and forest ecosystems will be secondary effects. The direct impacts of climate change will include drastic changes in precipitation, temperature, and extreme weather events (Brainard 44,121). These weather events could include "droughts, heavy precipitation, heat waves, and intense tropical cyclones" depending on the geographical region (Brainard 44). Regardless of whether or not changes in precipitation occur, the higher temperatures will increase the magnitude of evaporation (Brainard 121). Possible consequences of this could include greater agricultural demand for water and decreases in the water supply, often in places where water is already difficult to access (Brainard 49, 121).

Addressing the possible reduction in water availability will be the most important challenge for countries that already struggle with distributing their water supplies (Brainard 49). In Latin America, 14% of their people do not have adequate access to safe drinking water, the majority of whom also live in rural areas (Brainard 49). Small farmers will especially have trouble obtaining enough water to irrigate their crops (Brainard 122). If farmers are not able to irrigate their crops, especially in low latitudes (hot environments), then agricultural productivity will decrease and food will become scarcer (Brainard 120, 121). Extreme weather events will exacerbate this problem. Floods and droughts can damage crops and soil erosion from heavy rains would decrease the productivity of agriculture in these at-risk locations (Brainard 47).

No matter what the effects of climate change will be, they will most certainly have the greatest impact on impoverished people who are least equipped to adapt to these changes (O'Brien 180). When determining whether or not a country can adapt to climate change effectively, factors like "economic wealth, technology, information and skills, infrastructure, institutions, and equity" all help a nation adapt to these changes (Brainard 56). Coupled with poverty being the most significant inhibitor to a country's adaptability, Third World countries are significantly disadvantaged and vulnerable to the devastating consequences of climate change (Brainard 56; Mowforth 325-326). Although preventing further emissions of greenhouse gases may address the cause of the problem, addressing the adaptability of people and ecosystems can help reduce the severity of ecological and economic consequences (Mowforth 325-326).

Deforestation

Deforestation has always occurred in nature, but as with climate change, human activity has exacerbated the issue to the point where it is becoming a crisis. From 1980 to 1995, approximately 12 million hectares of global forest were lost annually (Bowles 115). That number

has since grown to 13 million hectares of annual loss with Indonesia and Brazil responsible for half of that destruction (Brainard 16-17). The Amazon has lost 17% of its forests while Sumatra in Indonesia has lost 85% of its forests (WWF). The degree of deforestation in Indonesia is not as surprising, however, since 90% of all rubber is produced in this region in addition to "palm oil, sugar, rice, and corn" (WWF). Agriculture and logging are the two greatest threats to forests today with agriculture being disproportionately responsible for at least 75% of all deforestation (Brainard 17).

Deforestation can occur in several different ways. This includes "fire, clear-cutting… unsustainable logging or timber, and degradation due to climate change" (WWF). These methods can have serious consequences for the land's quality. Erosion, land degradation, and overexploitation damage the soil, land, and ecosystems so severely that the damage is irreversible (Brainard 45). As farm land becomes degraded, farmers are prompted to continue cutting down forests to create new land for agriculture, further harming the biodiversity of that area, degrading the soil quality, and creating the need to cut down even more forest, continuing the cycle (van Ginkel 253).

Not only does deforestation cause soil erosion and alter the hydrological cycle, but many species' populations, both known and unknown, are lost (Schroth 17). This loss is not only significant to the forest's health, but the loss of biodiversity also impacts the 1 billion people living in or near the forest who depend on its services for their survival (Brainard 88). Of all of the industries that utilize tropical forest products, timber production is one of the most harmful to biodiversity (Bowles 168). Conservationists encourage laws to be made to protect tropical rainforests and to control the extent of the damage caused by forestry, but these laws are often circumvented or outright ignored (WWF). Although approximately half of the wood that is illegally removed from forests is used for fuel by the poor, the violation of these laws by

corporations have significant consequences for the people and governments who reside there (WWF). Companies that follow the law are put at a disadvantage, the global prices of timber decrease, governments no longer have access to the taxes they would have otherwise received, and the vulnerable people who live in these forests are often subjected to human rights violations by the corporations (WWF).

Two possible solutions to this extensive problem are the establishment of national parks and the use of agroforestry (Schroth 17). Agroforestry is "a dynamic, ecologically based natural resource management practice" that works to promote structural complexity of agricultural lands in order to preserve the area's biodiversity and maximize their economic and social uses (Schroth 2). Although parks do not usually receive adequate funding, they are effective in preventing deforestation and protecting biodiversity (Schroth 17). In spite of this, the total value of parks is difficult to determine (Smith 174-175). In addition to protecting the environment, parks also contribute to "research, education, and aesthetic pleasure" as well as the "maintenance of essential ecological functions and the existence and option value of the biodiversity they preserve" (Smith 174-175). In this way, parks not only prevent the anthropogenic destruction of forests, but they also preserve the complexity of forests that will enable them to better withstand the negative effects of climate change.

Tourism

Another important role of national parks is that they are an attractive landmark for tourists and a vital resource for the tourism industry (Smith 175). Although the majority of control over park access has been controlled by the state, the tourism industry has been able to use this resource to not only promote the maintenance and protection of wildlife, but also to aid the people living in poverty in these areas (Smith 174-175). Tourism has been growing rapidly in

countries that contain about 60-70% of all biodiversity (Fennel 43). The vast range of services that are provided by these biodiverse regions are responsibly used by the tourism industry (Fennel 42). Two types of tourism that are designed to benefit the environment and the poor are ecotourism and pro-poor tourism. Ecotourism is travel to an environment in a way that is educational and helps the local people as well as the environment (Fennel 41). Pro-poor tourism is an ethics-based form of tourism that "focuses directly on the needs of the poor" (Mowforth 343).

Unfortunately, not all ecotourism fulfills its promise of ethical treatment. Within the tourism industry, there is a problem of the companies exploiting the native workers (Bordeau 31). In Machu Picchu, Peru, tourism companies hire farmers as porters when they do not have many options for employment and force them to work for low wages in terrible conditions (Bordeau 31). Since there is such a high demand for jobs, wages are kept low and the companies manipulate the farmers into accepting these terrible work conditions (Bordeau 32-33). Since there is not much work outside of the tourism industry in that isolated location, farmers are pressed to accept these terms and then live with their families in poverty (Bordeau 33). This poverty is exacerbated if the porter has 3-5 children (Bordeau 32). Laws have been made to protect these workers, called the Porters' Law, but a review found that only 3 out of 36 travel agencies actually complied with the laws (Bordeau 32).

One factor that is impacting all tourism agencies equally, regardless of the treatment of their workers, is the threat of climate change (Mowforth 326). Extreme climate events provide substantial risk to travel agencies and their locations (Mowforth 326). In spite of this, the tourism industry, in some cases, has been able to aid the local people and increase their adaptability to climate change (Mowforth 323). Obtaining a diverse income is important for the poor to be able to survive, and wildlife tourism has enabled the local poor to obtain some cash income (Smith

187). As an industry, tourism is able to work independently of droughts and can therefore act as a "drought buffer" and lessen the risk of loss of income (Smith 187). Tourism can also provide an alternate source of income, either as a complement to agriculture or a more viable alternative (Smith 188). Its role in helping alleviate poverty in certain areas will differ from one location to another, but tourism's potential for aiding the global poverty struggle while promoting conservation is promising (Mowforth 367).

Conclusion

Poverty in forested areas is ultimately dependent on biodiversity to provide a variety of services that people need to survive in low-income situations. Biodiversity, however, is often degraded or destroyed by activities and efforts related to poverty. Both poverty and biodiversity are at risk, especially from ecological factors like climate change, but biodiversity must be emphasized and conserved in order to protect the people in poverty who are at risk and improve their well-being. If not, then any attempts to help these people in any self-sufficient manner will not be effective. Furthermore, the association between biodiversity conservation and poverty is a complex network of interconnected factors, the full extent of which exceed the limitations of this paper. More research is needed to form a more comprehensive understanding of this relationship.

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